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The edible Cucurbitaceae of Thailand and Malesia and the wild forms of the cultivated ones

W.J.J.O. De Wilde & Brigitta E.E. Duyfjes

Nationaal Herbarium Nederland,
Universiteit Leiden Branch,
P.O. Box 9514, 2300 RA Leiden,
The Netherlands

Summary. An enumeration of the 27 wild and cultivated edible species in Asia and Malesia, belonging to 15 genera of the family Cucurbitaceae is presented. Seven new forms are recognized including six for wild representatives: *Citrullus lanatus* (Thunb.) Matsum. & Nakai f. *amarus* (Schrad.) W.J. de Wilde & Duyfjes, *Cucumis melo* L. f. *agrestis* (Naudin) W.J. de Wilde & Duyfjes, *Cucumis sativus* L. f. *hardwickii* (Royle) W.J. de Wilde & Duyfjes, *Luffa acutangula* (L.) Roxb. f. *amara* (Roxb.) W.J. de Wilde & Duyfjes, *Luffa aegyptiaca* Mill. f. *sylvestris* (Miq.) W.J. de Wilde & Duyfjes, *Momordica charantia* L. f. *abbreviata* (Ser.) W.J. de Wilde & Duyfjes. Furthermore, all cultivars of the Wax Gourd appear to belong to the form *Benincasa pruriens* (Parkinson) W.J. de Wilde & Duyfjes f. *hispida* (Thunb.) W.J. de Wilde & Duyfjes.

Edible Cucurbits can be gathered from the wild, but they are mostly cultivated. Recognising their importance, Alefeld (1866) had enumerated the cultivated Cucurbits in Europe. The cultivated Cucurbits in SE Asia originated either from their own wild Asian stock, or had been introduced from other continents. In most cases, a wild progenitor of a cultivated Cucurbit is not directly evident, but wild forms or obviously most closely related wild species, can be indicated.

It remains unclear whether the wild forms of cultivated species are to be regarded as the truly wild botanical progenitors of the cultivated ones, or if they are to be regarded as feral forms that may have evolved later on by degeneration or retrogression from the original cultivated forms of unknown origin (Whitaker & Davis, 1962; Walters & Decker-Walters, 1988). As a matter of fact, a number of Cucurbit species were described for the first time

from plants found originally in cultivation, which implies that such names (and further subdivisions) may fall under the rules for cultivated plants, which are at present being developed as a system with a name code alongside the rules operative under the International Code of Botanical Nomenclature.

According to those concerned with cultivated plants, cultivated material belongs to a "culton" (or "cultigenous species" or "cultispecies") containing cultivars, not participating in evolution. "Culton" should then be opposed to the term "taxon" (composed of materials from the wild) which is an evolutionary entity. However, well-established correctly published names cannot be discarded without great nomenclatural disturbance.

During our taxonomic revision work on Cucurbitaceae, we have found it convenient to make distinction between the cultivated form which can be found as an escape in the wild, and the truly wild form. Generally these two categories are quite distinct, but on closer look, they intergrade morphologically. As such, we feel that within each species, the distinction of the cultivated plants from the wild ones only merit the rank of form (forma), i.e. a botanical wild form and a cultivated form. This view was already expressed by Meeuse (1962) in a note under *Citrullus lanatus*, the Watermelon. We do not follow authors like Grebenščikov (1986) for *Momordica charantia*, Kirkbride (1993) for *Cucumis melo*, or Merrick (1990) for *Cucurbita argentea*, who accept the rank of subspecies for the wild form, but we use consistently the rank of forma within all species known as cultivated.

For Thailand and Malesia, the 15 genera listed below, comprising 27 species, are relevant, but still more truly wild species may be found locally used for vegetables or drugs. The genus *Praecitrullus* with one species known only in cultivation in India, can be expected in our area in the future. Those genera introduced from outside Asia are marked with an asterisk.

In several cases, the formal status as forma for the wild plants is proposed here for the first time. For the genera *Gynostemma, Hodgsonia, Momordica, Siraitia* and *Trichosanthes* which have been recently treated taxonomically by the authors, full genus and species descriptions are left out; only the literature references are given.

1. *Benincasa* Savi
2. **Citrullus* Schrad.
3. *Coccinia* Wight & Arn.
4. *Cucumis* L.
5. **Cucurbita* L.
6. **Cyclanthera* Schrad.
7. *Gynostemma* Blume
8. *Hodgsonia* Hook. f. & Thomson
9. **Lagenaria* Ser.
10. *Luffa* Mill.

11. *Momordica* L.
12. *Praecitrullus* Pangalo
13. **Sechium* P. Browne
14. *Siraitia* Merr.
15. *Trichosanthes* L.

1. **Benincasa** Savi

Benincasa Savi (1818) 158. Type: *Benincasa cerifera* Savi.

Stout herbaceous annual climber; monoecious (sometimes flowers hermaphroditic); plant hairy. Probract present. Tendrils branched. Leaves simple. Flowers: solitary, long-pedicelled, large; petals free, yellow. *Male flowers*: receptacle-tube shallow; sepals entire or serrate, recurved; petals large, obovate, margin entire; stamens 3, inserted towards the base of the receptacle-tube; filaments free, short, anthers all 2-thecous, exserted, thecae flexuous, connective broad, thin, 3-lobed; disc absent or low. *Female flowers*: perianth as in male flowers; ovary ovoid or narrowly ellipsoid, densely hairy, style short, thick, inserted on disc, stigma robust; ovules numerous, horizontal; staminodes present, sometimes with reduced anthers. Fruit a pepo, large, indehiscent. Seeds: numerous, flat, margin only slightly thickened.

The genus *Benincasa* Savi is monotypic with the only species *B. pruriens* (Parkinson) W.J. de Wilde & Duyfjes, of Asian-Pacific origin. It is mainly known as widely cultivated, for its edible fruits in several forms or cultivars. Its precise area of origin is unknown, but it is speculated to be China, India, Indochina, or most probably, the Pacific. The fruits are usually large, (green or) white with a waxy skin, and greatly varying in shape and size: subglobose or broadly ellipsoid, 10 cm diameter or more, to elongate up to 120 cm long. Fruits much smaller than 10 cm diameter were mentioned only in more recent literature (Telford, 1982; Whistler, 1990; Rifai & Reyes, 1993; Marr *et al.*, 2007) and can be seen in several herbarium-collections from different localities. Telford (1982, f. 38A–E) described under the name *B. hispida* a wild population of NE Queensland originally published by Mueller (1868) as *Cucurbita vacua*. De Wilde & Duyfjes (2007b) recognized the small-fruited wild populations as the wild form, f. *pruriens*; all cultivated plants belong to f. *hispida*.

1. Benincasa pruriens (Parkinson) W.J. de Wilde & Duyfjes (2007b) 268.
Cucurbita pruriens Parkinson (1773) 44; Merr. (1954) 350.
Cucurbita pruriens Sol. in G. Forst., (1786) 92, *nom. nud.*
Benincasa hispida (Thunb.) Cogn. var. *pruriens* (Parkinson) Whistler (1990) 119, *nom. inval.* Type: *Banks & Solander s.n.* (holo BM, not seen).
Benincasa hispida (Thunb.) Cogn. (1881) 513; Gagnep. (1921) 1055; Cogn. & Harms (1924) 164; Craib (1931) 757; Merr. (1935) 379; Chakrav. (1959) 84; Backer (1964) 301; P.H. Hô (1991) 719, fig. 1995; Keraudren (1975) 45; Walters & Decker-Walters (1989):

274; Rifai & Reyes (1993) 95; C. Jeffrey (2001) 1530.
Cucurbita hispida Thunb. (1783) 38; in Murray (1784A) 868; (1784B) 322. Type: *Thunberg* 22775 (UPS), Japan.
Benincasa cerifera Savi (1818) 158; C.B. Clarke (1879) 616; S.K. Chen (1995) 334, pl. 87: 1–5. Type: unknown, described from a cultivated plant, possibly originating from eastern Asia.
Cucurbita villosa Blume (1826) 931. Type: *Blume* 1079 (holo L), Indonesia, Java.
Cucurbita farinosa Blume (1826) 931. Type: not found, Indonesia, Java.
Cucurbita littoralis Hassk. (1844) 190. Type: not found, Indonesia, Java.
Gymnopetalum septemlobum Miq. (1856) 679. Type: *Junghuhn s.n.* (holo L, barcode: L0587810), Indonesia, Weltevreden.

Annual herb, shoots 2–7 m long, stem 3–5 mm diameter, sparsely or densely grey or rusty hairy, hairs 2–5 mm long. Probract narrow- or broad-elliptic, (0.5–)1–2 cm long, acute or blunt, ± hooded or concave. Tendrils 2- or 3-branched. Leaves 5–7-angular or shallowly (sometimes deeply) lobed, 7–20 cm diameter, base cordate, apex (of lobes) acute-acuminate, margin coarsely dentate, cystoliths not apparent; petiole 4–12(–20) cm long. *Male flowers*: pedicel 4–15 cm long, hairy; receptacle-tube broadly cup-shaped, 4–6 by 10–15 mm; sepals narrowly elliptic or linear, 10–20 mm long, acute, entire, or (deeply) 2–3-lobed or serrate; petals obovate to narrowly elliptic, 25–40(–70) mm long, subacute or obtuse, with minute mucro, hairy on veins outside; stamens inserted at *c.* ? from the base in the receptacle-tube, very densely pilose-hairy where the stamens are inserted, the hairs screening off a small basal glabrous chamber without or with an inconspicuous disc at the bottom (see note), filaments glabrous, erect, broad, 2–3 mm long; anthers somewhat connivent, 4–5 by 5–7(–10) mm, somewhat exserted, thecae sigmoid along a broad, flat 3-lobed connective. *Female flowers*: perianth similar as in male but somewhat smaller; pedicel 2–4 cm long; ovary densely hairy, (narrowly) ovoid or (narrowly) ellipsoid (cylindrical), 15–20(–40) by 5–10(–15) mm, style stout, 2–3 mm long, stigma stout, 5–10 mm diameter, undulating by 3 horseshoe-shaped lobes; disc a low ± undulating ring; staminodes inserted close to the disc, mostly inconspicuous, 1–2 mm long, flat. Fruit solitary, globose, ellipsoid or narrowly ellipsoid, 4–120 cm long, green or green with a white waxy layer, glabrescent; pericarp thin, leathery, when old woody, 1–1.5 mm thick; mesocarp ± absent or thick and fleshy; fruiting pedicel 3–5 cm long, usually curved, leaving a concave scar after breaking off. Seeds ovate-elliptic, 7–10 by 4–7 mm, pale, faces not ornamented, margin narrow, finely 2-grooved.

DISTRIBUTION. Widely cultivated in SE Asia (and elsewhere), the wild form mainly in C and E Malesia, Australia and in the Pacific; see further under the forms.

NOTES. Young developing leaves have small glands on the blade, and their lobe-apices develop precociously and are conspicuously darker on drying, as was also observed by Cogniaux & Harms, 1924: 167 (note by Harms). This phenomenon is also obvious in not closely related *Mukia*, *Cucumis sativus*, and some other genera.

A more conspicuous disc in the (male) flower can be found in cultivated varieties and in hermaphroditic flowers.

KEY TO THE FORMS

Fruit subglobose to oblong (10–)20–60(–120) by 10–25 cm. Seeds 8–10 mm long. Cultivated ..... **a.** f. ***hispida***
Fruit globose or ellipsoid, 4–8 cm long. Seeds 7–8 mm long. Wild ..... **b.** f. ***pruriens***

a. Benincasa pruriens (Parkinson) W.J. de Wilde & Duyfjes f. **hispida** (Thunb.) W.J. de Wilde & Duyfjes, *comb. & stat. nov.*
Cucurbita hispida Thunb. (1783) 38.

Stout plant with grey or rusty coloured hairs. Flowers large, in *male* 6–10 cm diameter. Fruit subglobose or (long-)ellipsoid, (10–)20–60(–120) cm long; pericarp hard-leathery, *c.* 0.5 mm thick; mesocarp fleshy, 2–10 cm thick. Seeds 8–10 mm long, embedded in rather firm pulp.

DISTRIBUTION. Widely cultivated for the fruit with thick fleshy mesocarp, cooked as a vegetable.

NOTE. The form *hispida* comprises all cultivated or escaped varieties or cultivars of the Wax Gourd.

b. Benincasa pruriens (Parkinson) W.J. de Wilde & Duyfjes. f. **pruriens**
Cucurbita vacua F. Muell. (1868) 186.
Benincasa vacua (F. Muell.) F. Muell. (1882) 76. Syntypes (Telford 1982): *Dallachy s.n.* 28 Sept. 1867 & 20 Nov. 1867 (MEL, not seen), Queensland, Rockingham Bay.
Benincasa hispida (Thunb.) Cogn., for the wild form: I. Telford (1982) 170; Peekel (1984) 547, fig. 874.

(Fig. 1)

Plants generally of a more delicate stature compared to cultivated form *hispida*; hairs grey(-brown) coloured. Flowers smaller, in male 5–7 cm diam. Fruit globose or ellipsoid (subacute at both ends), 4–8 cm long; pericarp woody, 1–1.5 mm thick; mesocarp ± absent. Seeds 7–8 mm long, embedded in rather juicy whitish pulp.

DISTRIBUTION. Thailand (possibly), Borneo, Java, Lesser Sunda Islands, Celebes, Papua New Guinea (New Ireland, fruit ellipsoid), Australia (Queensland), Solomon Isl., and islands in the Pacific.

Fig. 1. *Benincasa pruriens* f. *pruriens*. Sabah, Luasong. Photo: de Wilde.

HABITAT. Disturbed areas in lowland rainforest, forest edges, open forest, river banks, scrub-land and beach-vegetation; up to 700 m altitude.

NOTE. Forms similar to the truly wild form of *Benincasa pruriens* possibly developed from escaped populations of the cultivated form *hispida* in natural places. In China, the wild form apparently has never been found. As the oldest collections of the wild form, with very small fruits, come from E Malesia, Queensland, and The Pacific, this area could be the place of origin of *Benincasa.* According to De Wilde & Duyfjes (2007b), the Pacific is the most plausible place of origin.

2. citrullus Schrad.

Citrullus Schrad. (1836) 279, *nom. cons.*; Naudin (1859b) 99; Cogn. (1881) 507; Cogn. & Harms (1924) 102; Meeuse (1962) 54; I. Telford (1982) 173; Greb. (1986) 932; C. Jeffrey (2001) 1533. Type: *Citrullus vulgaris* Schrad.
Colocynthis Mill. (1754), without pagination, *nom. rejic.*; Chakrav. (1959) 112.

Herbs, annual or perennial with root-stock, trailing or climbing; monoecious; plant scabrous or soft-hairy. Probract present. Tendrils branched, unbranched or spinescent (not in Asia). Leaves simple, ± pinnatilobed. Flowers solitary, pedicelled, medium-sized, petals (nearly)

free, yellow. *Male flowers*: receptacle-tube short, broadly campanulate; sepals narrow; petals ovate-oblong, obtuse, margin entire; stamens 3, inserted near the base of the receptacle-tube, filaments free, short, anthers two 2-thecous, one 1-thecous, thecae sigmoid, connective broad, flat; disc inconspicuous. *Female flowers*: perianth as in male; ovary ovoid or subglobose, hairy, style short, stigma 3-lobed, ovules numerous, horizontal; disc not apparent; staminodes small. Fruit a pepo, (small or) large, firm-walled, indehiscent. Seeds numerous, compressed, ovate(-oblong) in outline, (nearly) smooth, margined or not.

DISTRIBUTION. A genus of 4 species in Africa, east to Pakistan; *Citrullus lanatus* widely cultivated.

1. Citrullus lanatus (Thunb.) Matsum. & Nakai (1916) 30 (not seen); Meeuse (1962) 57; Backer (1964) 300; C. Jeffrey (1967) 46, f. 5; (2001) 1533; H. Hara (1969) 346, f. 5; Keraudren (1975) 106; I. Telford (1982) 173; S.K. Chen (1995) 336, pl. 87: 6–9.
Momordica lanata Thunb. (1794) 13. Type: *Thunberg s.n.* (UPS, photo seen), Cape Prov., Republic of South Africa.
Cucurbita citrullus L. (1753) 1010.
Colocynthis citrullus (L.) Kuntze (1891) 256.
Cucumis citrullus (L.) Ser. (1828) 301. Type of *Cucurbita citrullus* not yet designated (see: Linnaean Typification Project).
Citrullus vulgaris Schrad. (1836) 279; Naudin (1859b) 100; Gagnep. (1921) 1056; Craib (1931) 760. Type: unknown.
Citrullus edulis Spach (1838) 214; Miq. (1856) 662. Type: unknown.

Annual herb; stems to 3 m long, 2–4 mm diameter, softly grey-hairy, hairs 2–3(–5) mm long. Protract oblong, (sub)obtuse, narrowed at base, 0.5–1.5(–2) cm long, glands not obvious. Tendrils 2- or 3-branched. Leaves ovate to oblong in outline, 5–20 by 3–15 cm, pinnately (deeply) 3–5-lobed, base shallowly cordate, apex and apices of lobes rounded, obtuse or acute, margin irregularly dentate, glabrescent above, scabrid below; cystoliths and glands not obvious; petiole 3–12 cm long, soft hairy. *Male flowers*: pedicel 1–8 cm long, hairy; receptacle tube 3–4 mm long, villous-hairy; sepals linear, 3–5 mm long; petals 5–15 mm long; filaments *c.* 2 mm long, glabrous, anthers connivent into a globose mass *c.* 3 mm diameter. *Female flowers*: pedicel 0.5–4 cm long; ovary 6–12 mm long, style 4–5 mm long. Fruit solitary, (sub)globose or ellipsoid, (3–)6–30(–60) cm long, (pale) green or greyish green without or with stripes or blotches, or yellow, glabrescent, smooth; pericarp hard but not woody; pulp (including mesocarp) white, yellow or pink(-red); fruiting pedicel 2–7 cm long. Seeds 6–12 mm long, smooth or ± rough, white, brown or nearly black, margin absent or present.

DISTRIBUTION. Indigenous to southern Africa, the original wild form was probably found chiefly in the Kalahari desert; there are cultivated forms with numerous variants in the warmer parts all over the world.

KEY TO THE FORMS

Fruit globose, (3–)6–20 cm diameter ..... **a.** f. ***amarus***
Fruit subglobose or ellipsoid, 20–60 cm long ..... **b.** f. ***lanatus***

a. Citrullus lanatus (Thunb.) Matsum. & Nakai f. **amarus** (Schrad.) W.J. de Wilde & Duyfjes, *stat. nov.*
Colocynthis amarissima Schrad. (1833) 2, nom. nud.
Citrullus amarus Schrad. (1836) 279; (1838) 413. Syntypes: *Ecklon & Zeyher*, Rietvalley and Zwartland, Cape, Jan., Febr. (not seen).

VERNACULAR NAMES. Bittermelon, Tsamma (S Africa).

NOTE. The wild form, our present form *amarus*, was treated by Meeuse (1962: 57); he also commented on the distinction between the wild and cultivated forms and the area of origin in southern Africa. Wild forms, similar to the wild form from southern Africa, are also known from the rest of Tropical Africa and Australia (Telford, 1982: 173) and they may be found in drier areas in India and Malesia as well.

Citrullus lanatus f. *amarus* much resembles *Citrullus colocynthis*, the Colocynth. The latter occurs in northern Africa, extending east to Pakistan and western India, and is also widely established in semi-dry areas elsewhere, especially in Australia.

b. Citrullus lanatus (Thunb.) Matsum. & Nakai f. **lanatus**

This is the commonly grown and frequently escaped water melon of all areas. There are many cultivars, which are all covered by the general description of the species.

VERNACULAR NAMES. Watermelon, Sandía, Semangka (Indonesia).

3. Coccinia Wight & Arn.

Coccinia Wight & Arn. (1834) 347; Endl. (1839) 938; Miq. (1856) 673; Cogn. (1881) 528; Pax (1889) 35; Gagnep. (1921) 1053; Chakrav. (1959) 116; C. Jeffrey (1967) 56; Keraudren (1975) 65; A.K. Singh (1990) 21. Type: *Coccinia indica* Wight & Arn., nom. illeg. (= *Bryonia grandis* L; *C. grandis* (L.) Voigt), from India.
Cephalandra Schrad. (1836) 280. Type: *Cephalandra quinqueloba* (Thunb.) Schrad. (*Bryonia quinqueloba* Thunb.).

Herbaceous or (sub)woody climbers; dioecious; early glabrescent. Probract: small, caducous. Tendrils simple or 2-branched. Leaves simple, variable of shape. *Male flowers*:

solitary (or 2 or 3), (yellowish, not in Asia) or white; receptacle-tube cup-shaped; sepals 5, small; corolla campanulate, 5-lobed, lobes fused for *c.* 2/3, margin entire; stamens 3; filaments fused or free but tightly appressed forming a column; anthers all 2-thecous, or two 2-thecous and one 1-thecous, free or coherent into a globular synandrium; thecae 3-plicate; connectives broad; base of receptacle with an inconspicuous nectariferous disc (all species?). *Female flowers*: mostly solitary; perianth as in male; ovary ovoid or oblong, smooth or faintly ribbed, glabrous; ovules many, horizontal. Fruit berry-like, globose or elongate, moderate of size; pericarp thin. Seeds numerous, (ovate-)elliptic in outline, compressed.

DISTRIBUTION. A genus of *c.* 30 species in Africa; one species, *Coccinia grandis*, is widely distributed also in tropical SE Asia and N Australia; introduced in America.

1. Coccinia grandis (L.) Voigt (1845) 59; Backer (1964) 305; Keraudren (1975) 66, pl. 11: 1–3; I. Telford (1982) 176; P.H. Hô (1991) 727, fig. 2018; S.K. Chen (1995) 383, pl. 101: 1–3, 6; C. Jeffrey (2001) 1529.
Bryonia grandis L. (1767) 126; Lour. (1790) 595; Ser. (1828) 305. Lectotype (Jeffrey, 1967): *LINN 1153/2*, India.
Bryonia alceifolia Willd. (1805) 624. Type: not found, India.
Momordica bicolor Blume (1826) 928, including var. a & var. b. Type: *Blume* 1012 (holo L), Indonesia, Java.
Coccinia indica Wight & Arn. (1834) 347, nom. illeg.: Craib (1931) 761.
Cephalandra indica (Wight & Arn.) Naudin (1866) 16, nom. illeg.; C.B. Clarke (1879) 621; Ridl. (1922) 849.
Coccinia wightiana M. Roem. (1846) 93.
Coccinia grandis (L.) Voigt var. *wightiana* (M. Roem.) Greb. (1986) 929. Type: *Wight* 1123 (not seen), but *Bryonia grandis* L. cited by Wight & Arnott (1834) in the synonymy.
Coccinia cordifolia auct. non (L.) Cogn.: Cogn. (1881) 529, pro parte (excl. syn. *Bryonia cordifolia* L. = *Mukia maderaspatana*); Gagnep. (1921) 1054; Merr. (1935) 381.

Perennial, herbaceous or soft-woody climbers to 8 m tall, with tuberous rootstock, sparsely puberulous, early glabrescent; older stem to 15 mm across, with grey bark. Probract carnose, elliptic to oblong, 2–3 mm long. Tendrils simple. Leaves slightly succulent, 3–10 cm across, entire, (3- or) 5-angular or -lobed or deeply 3–5(–7)-lobed, or dissected to 4/5 deep, the lobes short or long, triangular to oblong, with apex acute or rounded, base deeply cordate, margin minutely (blackish) dentate-sinuate; glands small, several, near insertion of petiole and along lateral nerves; cystoliths in older leaves present; petiole 1–2.5 cm long. *Male flowers*: solitary (or 2 or 3); pedicel 20–50 mm long; receptacle-tube cup-shaped, narrowed to the base, 6–8 mm long, *c.* 6 mm wide at throat, greenish white; sepals oblong-subulate, *c.* 3 mm long, ± up-curved, pale green; corolla white (pale green veined), broad-campanulate, (15–)25–30 mm long, the lower (1/2–)2/3 fused, free lobes ovate-oblong, acute(-acuminate), inside (sparsely) pubescent; stamens inserted *c.* 5 mm below the

receptacle-throat, filaments either connate or free but coherent, forming a seemingly solid but hollow column (4–)5–6 mm long (sometimes leaving 3 openings at base), anthers two 2-thecous, one 1-thecous, free, but mostly coherent into a subglobose whole, *c.* 5 mm diameter; the receptacle-tube below the insertion of the stamens densely white-hairy, hiding a basal hollow, *c.* 3 mm deep, containing a green-yellow cup-shaped disc adnate to the bottom of the tube. *Female flowers*: resembling male flowers, solitary; pedicel 1–3 cm long; ovary oblong, narrowed at both ends, 10(–13) by 2(–3) mm, style 3–5 mm long, at base surrounded by a cup-shaped disc, stigmas 3, broad, oblong, 5–7 mm long, papillose; staminodes minute. Fruit pendent, elliptic or oblong, 2.5–6 by 1.5–3 cm, apex subacute, green-white blotched or striped, ripening red (starting at the apex), pulp juicy, red; fruiting pedicel 1–4 cm long. Seeds 6–7 by 2.5–3 by *c.* 1.5 mm, ± smooth, whitish, margin narrow.

DISTRIBUTION. Widely distributed in the Old World, northern tropical Africa, east to Arabia through India (type) to China, Malesia and tropical North Australia.

ECOLOGY. Prefers a (strong to) light monsoon climate. Common in open forest, scrub, along waste land, and roadsides; 0–500 m altitude; flowering and fruiting throughout the year.

USES. Pickled young fruits and the young shoots are cooked and eaten as a vegetable, especially in India and Thailand.

NOTES. Fruits are (glaucous) green with contrasting white blotches in rows and turn into bright red when ripe, except for the very base. The pulp is frequently eaten by animals, mainly birds. Jeffrey (1980b: 803) comments on a personal communication to him by A.K. Singh, saying that in India there are two distinct variants: the wild variant with ellipsoid-oblong bitter fruits, and a cultivated variant with oblong, more obtusely rounded fruits with a sweet taste. The sweet-tasting fruits would belong to the type of *Coccinia grandis*, and the bitter or wild variant to *Coccinia 'wightiana'* or *Coccinia 'alceifolia'*. This division was formally published by Grebenščikov (1986: 929) as *Coccinia grandis* (L.) Voigt var. *wightiana* (M. Roem.) Greb. (see also Boonkerd *et al.*,1993: 151). However, the division of the available names for the two variants is highly speculative, and we maintain that all three names represent only leaf-variants of the wild plants, which can be found in any place in the vast area of the species. The cultivated variant with sweet fruits does as yet not occur in Thailand, and plants in Indochina and Malesia, also those providing a vegetable, all belong to the one botanical species *Coccinia grandis* (L.) Voigt. If the recognition of the sweet-fruited or other cultivated variant(s) appears desirable, these should be named and effected as cultivar(s) within an as-yet- undescribed forma alongside the wild form, forma *grandis*.

4. **Cucumis** L.

Cucumis L. (1753) 1011; (1754) 442; Lour. (1790) 591; Ser. (1828) 299; Roxb. (1832) 719; Wight & Arn. (1834) 351; Endl. (1839) 928; M. Roem. (1846) 15; Miq. (1856) 670; Hook.

f. (1867) 826; C.B. Clarke (1879) 619; Cogn. (1881) 479; Pax (1889) 27; Cogn. & Harms (1824) 116; Chakrav. (1959) 98; Meeuse (1962) 59; C. Jeffrey (1967) 94; Keraudren (1975) 69; J.H. Kirkbr. (1993) 1–159; Schaefer (2007); Renner et al. (2007, in press). Lectotype (Britton & Wilson, 1925): *Cucumis sativus* L.
Melo Mill. (1754) without pagination. Lectotype (Swart 1960, 1979): *Cucumis melo* L.

Small or medium annual or perennial climbers (rarely suberect); monoecious (rarely dioecious); plant scabrous or setose, stem 1–4 mm diameter. Probract absent. Tendrils simple. Leaves simple. Flowers solitary or few-fascicled; pedicels short; corolla composed of partly fused petals, small- or medium-sized, yellow. *Male flowers*: receptacle-tube campanulate or turbinate, small; sepals small, mostly linear; petals (corolla) with margin entire; stamens 3, free, inserted about halfway the receptacle-tube, filaments short, anthers two 2-thecous, one 1-thecous, thecae sinuate, 3-plicate or S-shaped, connective considerably produced apically; disc large, gland-like, free from the tube. *Female flowers*: usually solitary; ovary hairy, hairs sometimes apical on small protuberances, ovules numerous, horizontal; perianth as in male flowers but somewhat larger, stigma cupular, with finger-like projections; staminodes often present, small; disc surrounding base of style, free from the tube. Fruit a (large) pepo (fleshy berry), indehiscent, pubescent or glaubrous, or with fleshy spines or tubercles, green, yellow or orange, (rarely maturing underground in *C. humifructus*, southern Africa). Seeds numerous, flat, elliptic or oblong, pale, not sculptured, unmargined with acute edge, unwinged (or rarely winged).

DISTRIBUTION. About 30 species in the Old World, mostly Africa; 2 species widely cultivated.

NOTE. According to molecular research (Renner *et al.,* 2007, in press; Schaefer, 2007, and Ghebretinsae *et al.*, 2007) the genus *Cucumis* should include a number of smaller genera, including *Mukia*, but for the present purpose we treat *Cucumis* in the original sense.

KEY TO THE SPECIES

1. Fruits with long soft spines ..... ***C. anguria***
   Fruits smooth or shortly prickled 2

2. Leaf lobes rounded ..... ***C. melo***
   Leaf lobes acute-acuminate ..... ***C. sativus***

1. Cucumis anguria L. (1753) 1011; Meeuse (1962) 77 (including var. *longipes* (Hook. f.) A. Meeuse); J.H. Kirkbr. (1993) 37.

For the description see the cited literature.

NOTE. This African species has been introduced and cultivated in tropical America (originally in Jamaica and Trinidad) since a long time ago, and has become, in modern times, more and more cultivated elsewhere, e.g., in India. It can be expected in our area in the future. It has a wild variety in Africa, *C. anguria* L. var. *longaculeatus* J.H. Kirkbr. (1993: 39), which is also introduced in America.

Vernacular NAME. West Indian Gherkin.

2. Cucumis melo L. (1753) 1011; Lour. (1790) 591; C.B. Clarke (1879) 620; Cogn. (1881) 482; Gagnep. (1921) 1057; Cogn. & Harms (1924) 120; Craib (1931) 760; Merr. (1935) 378; Chakrav. (1959) 102; A. Meeuse (1962) 61; Backer (1964) 301; C. Jeffrey (1967) 106; Keraudren (1975) 70; I. Telford (1982) 189; J.H. Kirkbr. (1993) 79; S.K. Chen (1995) 338; C. Jeffrey (2001) 1512. Lectotype (Meeuse, 1962): *LINN 1152/8*, a plant cultivated at Uppsala, which is according to Kirkbride, *op. cit.*, a member of his subsp. *melo*; it belongs in the present article to our forma *melo*.
Cucumis melo L. var. *cultus* Kurz (1877) 46; C. Jeffrey (2001) 1512. Type: not indicated.
(Fig. 2)

Annual or subperennial trailer to 6 m long, plant (woolly) hairy, hirsute or hispid. Leaves ovate or subcircular in outline, 3–15 cm diameter, (deeply) lobed or unlobed, mostly hispid, lobes mostly rounded, margin shallowly sinuate-toothed; petiole 3–10 cm long. *Male*

Fig. 2. *Cucumis melo* f. *agrestis*. Indonesia, Lombok. Photo: de Wilde.

flowers: few-fascicled; pedicel 3–25 mm long, hairy; receptacle-tube 4–6 mm long; sepals 1–6 mm long; corolla united in lower third, lobes elliptic or oblong, 5–20 by 2.5–15 mm, apex obtuse or subacute, mostly finely hairy; filaments *c.* 0.5 mm long, anthers ± included, 1–2(–2.5) mm long, connective with (entire or) 2-lobed apical extension. *Female flowers*: solitary; pedicel 5–30(–50) mm long; ovary ellipsoid, 4–10(–14) mm long, densely fine-hairy, hairs spreading or appressed; sepals 1.5–3(–7) mm long; corolla 8–15(–25) mm long; style 1–2 mm long, stigma 1.5–2.5 mm diam., lobes lobulate. Fruit globose, (narrowly) ellipsoid or (ob)ovoid, 2–20(–100) by 2–5(–20) cm, smooth, variously coloured, green, yellow, white or brown, plain-coloured, striped or mottled, pericarp leathery, mesocarp juicy or carnose; fruiting pedicel 2–4 cm long. Seeds 4–15 mm long, 1–2 mm thick, usually unwinged.

DISTRIBUTION. All over southern Africa and (cultivated) in Madagascar; in Asia east to China and Japan, and through Malesia to Australia and the Pacific. Widely cultivated all over the world. Australia is a centre of complex variation, in fruit-size as well as in mode of dissection of the leaves (Telford, 1982: 189).

NOTES. The cultivated form and the wild form are segregated by Kirkbride (1993), as subspecies, distinguished by the hairs on the ovary: subsp. *melo* having the ovary with spreading pilose or lanose hairs; in subsp. *agrestis* the ovary is covered with retrorse or antrorse, appressed, sericeous hairs.

The wild form, with small fruits is widespread almost as the species and widely adventive as a weed. It was for the first time formally recognized and described as var. *agrestis* by Naudin (1859a: 73), later as a subspecies by Pangalo (1933). The wild form consists of truly wild plants (Africa) and those to be regarded as degenerated running wild feral forms originating from cultivated plants. The wild form morphologically varies continuously into cultivated varieties, and arbitrarily we distinguish the wild form as follows:

KEY TO THE FORMS

Plant more slender, leaf blades 2–5 cm diameter. Ovary with appressed hairs; corolla 5–8 mm long. Fruits 2–5 cm long. Seeds 4–8 mm long ..... **a**. f. ***agrestis***

Plant generally more robust, leaf blades 4–15 cm diameter. Ovary usually with ± spreading hairs; corolla 8–20 mm long. Fruits (5–)10–20(–100) cm long. Seeds 8–15 mm long .... **b**. f. ***melo***

a. Cucumis melo L. f. **agrestis** (Naudin) W.J. de Wilde & Duyfjes, *stat. nov.*

Cucumis melo L. var. *agrestis* Naudin (1859a) 73; S.K. Chen (1995) 339.

C. melo L. subsp. *agrestis* (Naudin) Pangalo (1933) 534; I. Telford (1982) 189; J.H. Kirkbr.

(1993) 81. Lectotype (Kirkbride, 1993): *Naudin s.n.* (P?), cultivated from seeds from India.
Bryonia callosa Rottl. (1803) 210.
Cucumis callosus (Rottl.) Cogn. & Harms (1924) 129; Chakrav. (1959) 100. Type: *Rottler s.n.* (K), Madras.
Cucumis trigonus Roxb. (1832) 722. Lectotype (J.H. Kirkbr. 1993): *Roxburgh s.n.* (K).
(Fig. 3)

Although truly wild-looking plants occur frequently in Africa, Asia, Malesia, Australia and the Pacific, its area of origin is considered by Meeuse, *op. cit.*, as Transvaal in southern Africa.

b. Cucumis melo L. f. **melo**

This form encompasses all possible cultivars of Melons. In previous literature frequently called 'culta' or 'cultus', see e.g. Kurz, 1877; Naudin, 1859: 34–83; Grebenščikov, 1986: 918; Paje & van der Vossen, 1993: 153; Jeffrey 2001.

The cultivar ('convar.') *conomon* (Thunb.) Greb. (Grebenščikov, 1986: 921) is used as a vegetable, especially in China, 'Pickling Melon'. This group is treated by Jeffrey (2001) under subsp. *agrestis.*

3. Cucumis sativus L. (1753) 1012; (1763) 1437; Lour. (1790) 591; C.B. Clarke (1879) 620; Cogn. (1881) 498; Gagnep. (1921) 1057; Cogn. & Harms (1924) 143; Merr. (1935) 378; Chakrav. (1959) 105; Backer (1964) 301; P.H. Hô (1991) 720, fig. 1997; Keraudren (1975) 71; I. Telford (1982) 189; Gildemacher & G.J. Jansen (1993) 157; J.H. Kirkbr. (1993) 84; S.K. Chen (1995) 339, pl. 88: 1–2; C. Jeffrey (2001) 1520. Lectotype (Ten Pas et al., 1985): *Burser vol. 17, no. 97* (UPS), from cultivation.

Annual climber or trailer, with fibrous roots, shoots to 5 m long, plant scabrid by bristly hairs. Leaves broadly ovate in outline, 10–15(–20) cm diameter, (shallowly or) deeply 5-lobed, the middle lobe largest, lobes at apex acute-acuminate, margin finely dentate, both surfaces sparsely hairy; petiole 5–10 cm long. *Male flowers*: solitary or few-fascicled; pedicel 5–20 mm long, hairy; receptacle-tube 4–5(–10) mm long, hairy; sepals 4–5(–7) mm long; petals (corolla) (10–)20(–25) mm long, at base fused for 1/3; filaments short, anthers 2.5–3 mm long, included or hardly protruding, connective extension slender, entire or 2-lobed; disc 1–1.5 mm diameter. *Female flowers*: solitary (or few-fascicled); pedicel 2–20 mm long; ovary 10(–20 in certain cultivars) mm long, glabrous or densely hairy; perianth similar as in male flowers; style short, stigma 2–3 mm diam., lobes lobulate; staminodes small. Fruit ellipsoid to cylindrical, 5–20(–50) cm long, blunt at apex, smooth or lowly prickled, mono-coloured, whitish or green, or variously bi-coloured (striped), white, green or yellow(-brown); pericarp thin; mesocarp carnose or pulpy, whitish or yellowish; fruiting pedicel 1.5–4 cm long. Seeds elliptic, 7–12 mm long, unwinged.

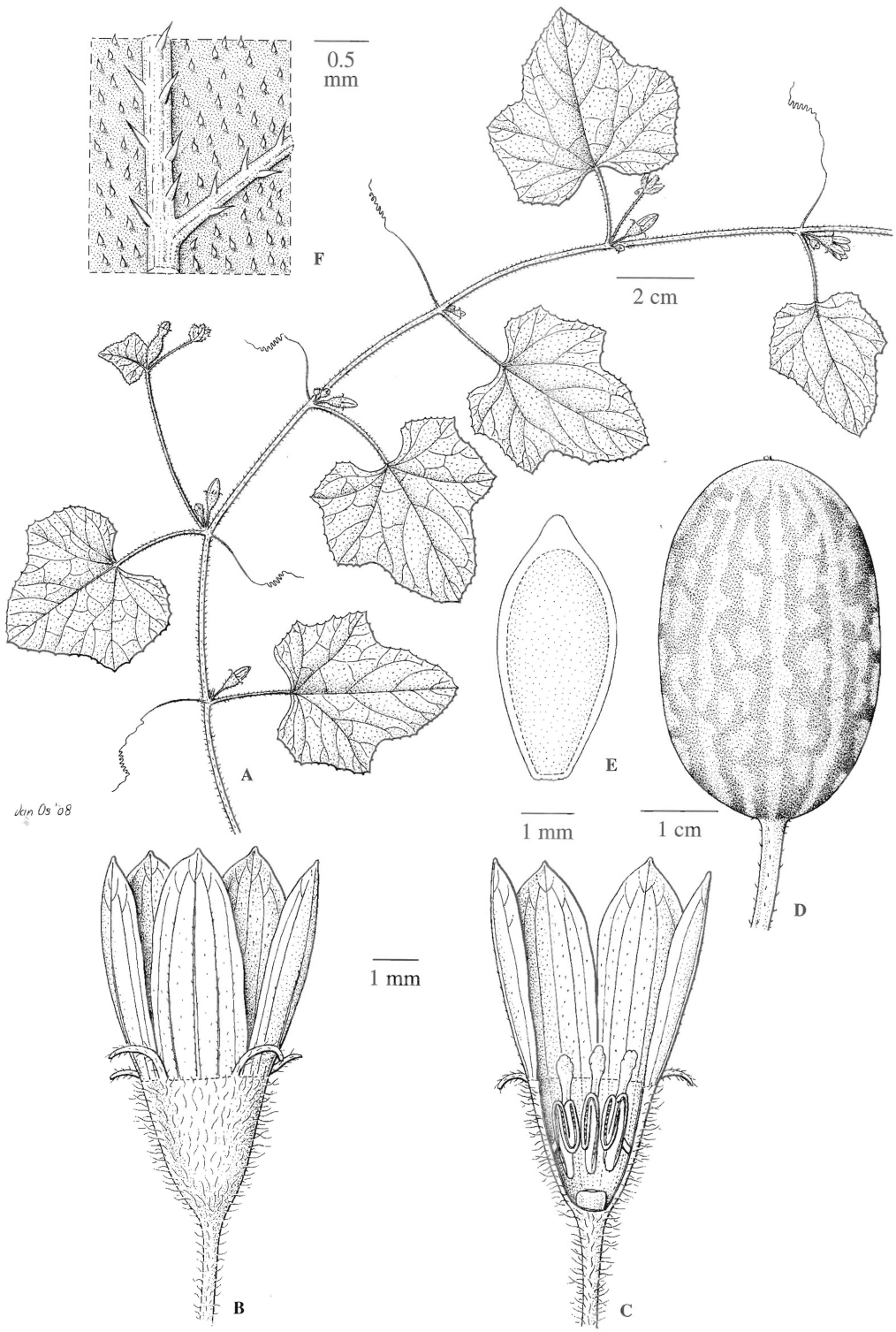

Fig. 3. *Cucumis melo* L. f. *agrestis* (Naudin) W.J. de Wilde & Duyfjes. **A.** Habit. **B–C:** Male flower, from outside and opened respectively. **D**. Fruit. **E**. Seed. **F**. Detail of lower surface of leaf blade (**A**: *Brass 24287*. **B–C, F**: *De Wilde & Duyfjes 21859*. **D–E**: *De Wilde & Duyfjes 21862*).

DISTRIBUTION. Originally occurring in SE Asia (northern India), at present cultivated world-wide.

NOTES. The variation in *Cucumis sativus*, in all parts, is considerable; there is also a broad range in sex-expression: unisexual flowers as well as hermaphroditic flowers exist.
All cultivars are in our present sense comprised in f. *sativus*.
The origin of *C. sativus* is thought to be in the southern Himalayas (Zeven & de Wet, 1982; Roy & Sunil Saran, 1990: 255).

The originally described wild botanical species *C. hardwickii* Royle, with bitter fruit, is from northern India and does also occur in northern Thailand but not in Malesia. Later additional collections have become known as the wild form of *C. sativus* (Duthie, 1903: 374). At present it is known as *C. sativus* L. var. *hardwickii* (Royle) Alef. We give it the status of forma.

Cucumis sativus L. f. **hardwickii** (Royle) W.J. de Wilde & Duyfjes, *stat. nov.*
C. hardwickii Royle (1839) 220, tab. 47: 3; Naudin (1859a) 30.
C. sativus L. var. *hardwickii* (Royle) Alef. (1866) 196; Gabaev (1932) 35. Type: *Royle s.n.* (LIV, not seen; iso K), India.

(Fig. 4)

5. Cucurbita L.

Cucurbita L. (1753) 1010; (1754) 441; Duchesne (1786) 148; Ser. (1828) 316; Naudin (1856) 5; Hook. (1867) 828; C.B. Clarke (1879) 621; Cogn. (1881) 542; Pax (1889) 33; Gagnep. (1921) 1064; Chakrav. (1959) 120; Backer (1964) 305; Keraudren (1975) 102; Widjaja & Sukprakarn (1993) 160; Stevels (1990) 137; C. Jeffrey (2001) 1541.
Pepo Mill. (1754) without pagination. Type: *Cucurbita pepo* L.

Medium-sized stout annual or perennial (not in our area) trailing or climbing herbs, stem 3–5(–10) mm diameter, plant hairy or scabrous; monoecious. Probract absent. Tendrils (2–)3–6-branched. Leaves simple, with long petiole; blade large, subentire or lobed, sometimes with whitish blotches, apex of lobes rounded or acute, margin finely or coarsely dentate. Flowers solitary (in male sometimes 2); receptacle-tube (shallowly) campanulate; sepals 5; corolla large, 6–10 cm long in cultivated species, petals fused for the lower half, orange(-yellow), lobes acute, ± out-curved at apex. *Male flowers*: pedicel long; sepals oblong or linear, or obovate and long-clawed; corolla-lobes ovate(-oblong), (sub)entire; stamens 3, filaments free, swollen at base (in cultivated Asian species), inserted towards the bottom of the receptacle-tube, anthers two 2-thecous, one 1-thecous, united (connivent) into an elongated whole, thecae plicate-sinuate, connective narrow, not apically produced, connate, hidden by the thecae; disc (pistillode) absent. *Female flowers*: pedicel shorter than in male flowers; ovary globose or ellipsoid, 1(–2) cm diameter, placentas 3(–5), ovules

Fig. 4. *Cucumis sativus* f. *hardwickii*. Thailand. Photo: P. Phonsena.

numerous, horizontal; perianth as in male flowers; style short, stout, stigma-lobes 3(–5), thickly carnose, each lobe shallowly lobed; disc absent or inconspicuous; staminodes short, at base of receptacle tube. Fruit a pepo, often with hard rind, very variable, small or (very) large, variable in shape and colour. Seeds numerous, medium or large, ellipsoid (-oblong) in outline, flat, little or not ornamented, margin narrow (rarely broad).

DISTRIBUTION. About 25 species. All *Cucurbita* species are originally indigenous in the New World; four species are cultivated all over the world, of which *C. pepo, C. maxima,* and *C. moschata* very extensively so in tropical as well as (in summer) in subtropical or extra tropical regions.

USES. Flowers, cooked or fried, are eaten. Fruits and (oily) seeds are widely used as food. Shoots are used as a vegetable. Also medicinal.

NOTE. Marked wild or feral forms do not occur in our area, and these have not been further accounted for. The three (four) cultivated species are each very variable and look-alike and can often only be recognized when completely known (habit, flowers and fruits); especially, well-developed fruit can be characteristic. Hybridization between the species seems difficult or absent. A brief description of each current species should suffice for distinction and naming a plant found in our area. The species of Thailand and Malesia are annual.

1. Cucurbita argyrosperma Huber (1867) 8; Mabb. (1985) 452; Merrick (1990) 77; C. Jeffrey (2001) 1541; L.H. Bailey (1948) 457. Type: from Mexico.
C. mixta Pangalo (1930) 258; Widjaja & Sukprakarn (1993) 163. Type: not seen.

NOTES. *C. argyrosperma* was formerly a part of *C. mixta* Pangalo. It has, for a long time, been included in *Cucumis moschata* and it seems genetically closest to *C. pepo*, but there are sterility barriers (Widjaja & Sukprakarn, 1993: 163). It is primarily cultivated for its nutritious seeds. It is infrequent in our area.

2. Cucurbita ficifolia Bouché (1837) 205; Andres (1990) 102; Roxas (1993) 165.

We have no knowledge of this species, but according to Roxas (1993) it is potentially a crop in our area, to be cultivated at higher altitudes.

3. Cucurbita maxima Duchesne (1786) 7; Lam. (1786) 151; Cogn. (1881) 544; C.B. Clarke (1879) 622; Chakrav. (1959) 123; (1990) 332; Keraudren (1975) 103; S.K. Chen (1995) 382; Paris (2000) 316; C. Jeffrey (2001) 1545. Type: *Lamarck s.n.* (P).

Plant, especially the leaves, rigid. Leaves lobed or not, ± reniform in outline. Flowers: pedicel terete; receptacle-tube campanulate; sepals linear in male and female flowers. Fruits (blue-)green or orange, smooth or warty; fruiting pedicel stout, ± terete, spongy, often with a ± fissured surface, not widened at the transition to the fruit. Seeds *c.* 20 mm long.

4. Cucurbita moschata Duchesne (1786) 7; Poiret (1818) 234; Backer (1964) 305; Paris (2000) 305–319.
C. pepo L. var. *moschata* (Duchesne) Lam. (1786) 152; Chakrav. (1959) 123; (1990) 332; Keraudren (1975) 104; S.K. Chen (1995) 379, pl. 100: 1–6; C. Jeffrey (2001) 1545. Type (Keraudren, 1975): original material unknown.
Gymnopetalum calyculatum Miq. (1861) 332. Type: *J. Amann* (= *S. Kurz*) *s.n.* (sphalm. *J. Amand*) (U), Indonesia, Bangka.

Plants including leaves pubescent, not scabrous. Leaves lobed, lobes acute or obtuse. *Male flowers*: pedicel subterete; receptacle-tube (shortly) campanulate; sepals linear. *Female flowers*: pedicel ± angular; receptacle-tube as in male; sepals ± linear or mostly *leaf-like broadened at apex* (long clawed). Fruit (depressed) globose, elongated or flask-shaped, often shallowly furrowed (sulcate) from apex to base of fruiting pedicel; fruiting pedicel angled, distinctly broadened at the transition to the fruit. Seeds variable in size, 10–15(–20) mm long.

NOTE. *Cucurbita moschata* is the most heat-tolerating species and found most frequently in the lowland tropics.

5. Cucurbita pepo L. (1753) 1010; Ser. (1828) 316; Naudin (1856) 29, tab. 2A; C.B. Clarke (1879) 622; Cogn. (1881) 545; Gagnep. (1921) 1065; Chakrav. (1959) 120; (1990) 332; Keraudren (1975) 105; P.H. Hô (1991) 721, fig. 2001; C. Jeffrey (2001) 1547. Lectotype (Keraudren, 1975): *LINN 1151.4*, but a *Burser* specimen is proposed as conserved type (Linnaean Typification Project).

Plant, including leaves, rigid or scabrous, (bushy, not trailing, in certain varieties). Leaves often deeply acutely lobed, lobes often lobulate. Flower pedicel subangular; receptacle-tube campanulate; sepals linear in male and female flowers. Fruits small, medium or very large, smooth, sometimes costate or verrucate; fruit pulp sometimes fibrous; fruiting pedicel rather slender, woody, angular (sulcate), not or only little thickened at the transition to the fruit. Seeds variable in size, 7–25 mm long.

NOTE. Here belongs the non-trailing sub-erect 'bushy' growing (Italian) 'Courgette' or 'Zucchini', nowadays a popular vegetable in Europe, and also the flat 'Scallop' or 'Patison'. See further Jeffrey (2001), and Goldman (2004).

6. Cyclanthera Schrad.

Cyclanthera Schrad. (1831) 2; Cogn. (1881) 822; Naudin (1859b) 156; Chakrav. (1959) 178; Backer (1964) 306; Keraudren (1967) 19. Type: *Cyclanthera pedata* Schrad., Mexico.

Annual or perennial herbaceous climbers, (sub)glabrous, monoecious. Probract absent. Tendrils simple or 2- or more-branched. Leaves simple, lobed or unlobed, or pedately

foliolate. Flowers small, pale greenish yellow; male inflorescences racemose or paniculate. *Male flowers*: receptacle-tube small, shallow; sepals small, subulate or linear; petals (free or) hardly connate at base, ovate-oblong, obtuse or acute; stamens united into a short central column, anthers connate into a head or into a horizontal (peltate) ring, opening with conduplicate slits or with a simple horizontal slit; disc (pistillode) absent. *Female flowers*: solitary or one co-axillary with male inflorescence; perianth as in male flowers; ovary narrowly ovoid or ellipsoid, somewhat oblique, rostrate, (1 or) 3 (or many)-loculed, style short, stigma hemi-spherical, large, ovules 1 to many per locule; staminodes absent. Fruit oblique, ovoid(-oblong), various of shape, not juicy, glabrous or mostly with soft spines, 1- or more-locular, 5- to many-seeded, when ripe elastically opening and jetting the seeds away, leaving central column and placenta. Seeds flattened, angular, often toothed at the end(s), faces smooth or rough.

DISTRIBUTION. An American genus with some 30 species, of which 2 species have been introduced as vegetable to other continents, including SE Asia.

KEY TO THE SPECIES

Leaves shallowly lobed. Flowers *c.* 3 mm diameter. Fruit soft-spiny, 2–3 cm long ..... **1. *C. brachystachya***

Leaves deeply lobed. Flowers *c.* 6 mm diam. Fruit smooth or sparsely soft-spiny, 5–7 cm long ..... **2. *C. pedata***

1. Cyclanthera brachystachya (Ser.) Cogn. (1881) 842; Keraudren (1967) 20, Pl. 5, 4–9; C. Jeffrey (2001) 1555.

Elaterium brachystachium Ser. (1828) 310; Cogn. (1881) 842. Type: based on an unpublished figure in Moçino & Sessé, tab. 38, fig. F, Mexico.

Cyclanthera explodens Naudin (1859b) 160; Backer (1964) 306. Type: plant cultivated at P, originating from New Grenade, Mexico.

Vigorous but slender climber to 5 m long, lanate or (finely) hairy on the nodes, later scabrous or glabrescent. Tendrils (1 or) 2-branched. Leaves triangular or ovate in outline, 6–9 cm long, 3- or 5-lobed up to halfway deep, lobes triangular, acute, margin finely dentate; petiole 1–5 cm long. *Male flowers*: in condensed 10–20-flowered racemes or few-branched panicles, 1–2.5 cm long, shorter than the leaves; pedicel 1–3 mm long; receptacle-tube *c.* 1.5 mm diameter; sepals less than 1 mm long, or ± absent; petals green-yellow, triangular, *c.* 1 by 1 mm, finely papillate; anther circular, horizontal, *c.* 0.5 mm diameter, opening with a circular slit. *Female flowers*: shortly pedicelled; ovary obliquely ovoid, style short, stigma broadly rounded. Fruit 2–3 cm long, ovoid-reniform, green, with soft spines; fruiting pedicel 1–3 cm long. Seeds *c.* 8 per fruit, 9–14 by 6–8 mm, ± 5-angled, 3-(or 5)-toothed at base, 3-toothed at apex, blackish brown.

DISTRIBUTION. Introduced from tropical America; in Java locally cultivated for the young shoots used as a vegetable.

2. Cyclanthera pedata Schrad. (1831) 2; Naudin (1859b) 159; Cogn. (1881) 825 (including var. *edulis*); Pax (1889) 38, f. 22; Chakrav. (1959) 178; S.K. Chen (1995) 396, pl. 101: 7–12; C. Jeffrey (2001) 1555. Type (Cogn., 1881): *Herb. Schrader*, cultivated, originating from Mexico.

Stout (sub)perennial herb, to 5 m long, glabrous; stem 2–5 mm diameter. Tendrils 2-branched. Leaves subcircular in outline, 5–20(–25) cm diameter, deeply 5–7(–9)-lobed, lobes oblong-lanceolate, acute, margin serrate-dentate; petiole stout, 5–15 cm long. *Male flowers*: in narrow, raceme-like panicles, 10–15(–20) cm long (peduncle 4–10 cm long), flowers many, ± tiered, and ± crowded in short-stalked fascicles along the rachis; pedicel 4–10 mm long; receptacle-tube 3–4 mm diameter; sepals less than 1 mm long; petals ovate-triangular, 1.5–2 mm long, acute, sparsely very short glandular-pubescent or papillose; anther circular, horizontal, 1–1.5 mm diameter, opening with a circular slit. *Female flowers*: solitary (or 2), co-axillary with male inflorescence; pedicel *c.* 3 mm long; ovary obliquely oblong, apex attenuate, style short, thick, stigma *c.* 2 mm diameter, shallowly lobulate. Fruit oblong, 5–7 by 2–3 cm, ± inflated, base attenuate, apex ± rostrate and hooked, 2-locular with 8–10 seeds, green (-yellow) or whitish, smooth or sparsely soft-spiny; fruiting pedicel 0.5–1 cm long. Seeds *c.* 10 per fruit, 10–12 by 7–8 by *c.* 2 mm, more or less 4-angular, apex appendiculate, base truncate, margin muricate, brown, faces faintly sculptured.

DISTRIBUTION. Widely distributed in Central and S America (Peru); introduced and locally commonly cultivated in mountainous areas in the southern Himalayas of India and in China. Not yet seen in Thailand or Malesia, but can be expected in the future as cultivated for the young shoots and fruits, used (cooked) as vegetable.

7. Gynostemma Blume

Gynostemma Blume (1825) 23; W.J. de Wilde & Duyfjes (2007a) 264. Type: *Gynostemma pedatum* Blume.

1. Gynostemma pentaphyllum (Thunb.) Makino (1902) 179; Backer (1964) 306; Keraudren (1975) 25, pl. 5: 1–7; C. Jeffrey (1980a) 10; (2001) 1511; S.K. Chen (1995) 387.
Vitis pentaphylla Thunb. (1784B) 105. Type: *Thunberg* 5858 (UPS, photograph seen), Japan.
Gynostemma pedatum Blume (1825) 23; C.B. Clarke (1879) 633 ('*pedata*'); Cogn. (1881) 913; Gagnep. (1921) 1080; Ridl. (1922) 851; Craib (1931) 766; Chakrav. (1959) 188.
Pestalozzia pedata Zoll. & Moritzi in Moritzi (1846) 31.

Zanonia pedata (Blume) Miq. (1856) 683. Lectotype (de Wilde & Duyfjes, 2007a): *Blume* 1429 (holo L, *barcode L 0588327*; iso L (6 sheets)), Java, Tjanjor & Krawang.

For the description see de Wilde & Duyfjes (2007a).

NOTE. This widespread Asian species has medicinal properties and is locally cultivated in Korea and China and recently also in northern Thailand. It is used as herbal tea.

Fig. 5. *Hodgsonia macrocarpa*. Sabah, Maliau Basin, Belian Camp. Photo: de Wilde.

8. Hodgsonia Hook. f. & Thomson

Hodgsonia Hook. f. & Thomson ('1853' 1854) 257; W.J. de Wilde & Duyfjes (2001) 169; C. Jeffrey (2001) 1525. Type: *Hodgsonia heteroclita* (Roxb.) Hook. f. & Thomson (*Trichosanthes heteroclita* Roxb.).

This Asian genus contains two species: *H. heteroclita* (Roxb.) Hook. f. & Thomson in India, China, Myanmar, Indochina and northern Thailand and *H. macrocarpa* (Blume) Cogn. (Fig. 5) in Peninsular Thailand and (West) Malesia. Both species have large seeds, rich in oil. In northern Thailand and China *H. heteroclita* is cultivated for their oily seeds. For taxonomy and descriptions see De Wilde & Duyfjes (2001).

Vernacular name. Kadam.

9. LAGENARIA Ser.

Lagenaria Ser. (1825) 25, tab. 2; C. Jeffrey (2001) 1531. Type: *Lagenaria vulgaris* Ser. (= *L. siceraria* (Molina) Standl.).
Adenopus Benth. (1849) 372. Lectotype (here chosen): *Adenopus longiflorus* Benth., West Africa.
Sphaerosicyos Hook. f. (1867) 824. Type: *Sphaerosicyos meyeri* Hook. f., nom. illeg. (= *Luffa sphaerica* Sonder; *Lagenaria sphaerica* (Sonder) Naudin, S. Africa).

Robust annual (or perennial) climbing herbs; monoecious (or dioecious); stem 2–5 mm thick; plant finely hairy. Probract absent (or present, not in Asia). Tendrils simple or 2-branched. Leaves simple, entire or lobed; petiole long, usually with a pair of glands at apex. Flowers solitary (or male flowers in raceme, not in Asia), pedicelled, large, opening at night, petals white. *Male flowers*: pedicel long; receptacle-tube (broadly) campanulate or cylindrical; sepals narrow; petals free, obovate, margin entire or ± crisped; stamens 3, short, filaments free, inserted on the tube towards the base, anthers coherent but free, two 2-thecous, one 1-thecous, thecae triplicate and often also much contorted, connective broad; disc present. *Female flowers*: pedicel shorter than in male; ovary hairy, ovules numerous, horizontal; perianth as in male, but receptacle-tube short; style short, stigma consisting of 3 subsessile parts, each 2-lobed; disc absent; staminodes small. Fruit large, hard-shelled, inside fleshy, indehiscent, green or yellowish. Seeds numerous, compressed, margin ± distinct.

DISTRIBUTION. About 6 species in Africa, one also in S America; one species, *Lagenaria siceraria,* widely cultivated.

1. Lagenaria siceraria (Molina) Standl. (1930) 435; A. Meeuse (1962) 83; Backer (1964) 302; C. Jeffrey (1967) 51; (2001) 1531; Keraudren (1975) 93; Widjaja & Reyes (1993) 190 with figure; S.K. Chen (1995) 348, pl. 91: 1–6; A.C. Clarke *et al.* (2006) 893.
Cucurbita siceraria Molina (1782) 133. Type: *Molina,* South America, Chile (not seen).
Cucurbita lagenaria L. (1753) 1010. Lectotype (C. Jeffrey, 1967): *LINN 1151/1* (LINN), a cultivated plant at Uppsala.
Lagenaria vulgaris Ser. (1825) 25, tab. 2; Naudin (1859b) 91; Cogn. (1881) 417. Type: not indicated.
Cucurbita lagenaria var. *oblonga* Blanco (1837) 772; Merr. (1918) 373. Type: not indicated, Philippines.
Cucurbita lagenaria var. *villosa* Blanco (1837) 772; Merr. (1918) 373. Type: not indicated, Philippines.
Cucurbita idolatrica Willd. (1805) 607; Blume (1826) 930. Type not indicated, 'Habitat in Guinea'.

Robust climber or trailer to 5 m long; stem ridged, 2–5 mm diameter, glabrescent. Probract absent. Tendrils 2-branched. Leaves reniform suborbicular or ovate in outline, entire or obscurely 3–9-lobed, 5–30 cm diameter, base cordate, apex obtuse or acute, margin (sparsely) finely dentate, pubescent, cystoliths not obvious; petiole 4–20 cm long, laterally at apex with 2 small (raised) glands. *Male flowers*: pedicel 4–30 cm long; perianth 40–60(–120) mm diameter; receptacle-tube (long-)campanulate, slightly bulbous at base, 10–15 mm long, pubescent; sepals spaced, narrowly triangular or linear, *c.* 5 mm long; petals broadly obovate, 20–40(–50) by (10–)15–35 mm, pubescent, margin (sub)entire; stamens inserted below halfway in the receptacle-tube, anthers forming a ± elongate whole, filaments free, 2–3 mm long, glabrous; disc gland-like, at base of tube. *Female flowers*:

pedicel 5–7 mm long; ovary cylindrical, reversed flask-shaped or obovoid, 1–2 cm long, villose; receptacle-tube 2–3 mm long; sepals and petals as in male flowers but somewhat smaller. Fruit solitary, ellipsoid or variously flask-shaped, often with a long 'neck', (6–)10–80 cm long, up to 20 cm wide, glabrescent; fruiting pedicel 5–10 cm long. Seeds numerous, subtruncate at both ends, (17–)10–20(–25) mm long, pale brown, ± 2-horned on the broader end, faces shallowly sculptured with two submarginal ridges, margin narrow but distinct.

DISTRIBUTION. Africa; world-wide cultivated.

NOTES. *Lagenaria siceraria*, very variable in fruit- and seed-size and shape, was already known in pre-Columbian times in S America, but it possibly originates from Africa. Small-fruited forms, not necessarily wild forms, are known from e.g., the Moluccas (Rumphius, 1747, 5: tab. 144), or from Africa (Naudin, 1855: 65, with coloured figure, the fruit being about 6 cm long and provisionally named *L. microcarpa*, nom. inval., from Gabon). In absence of a clear indication of a wild form we refrain from designating a formal wild form. Small immature fruits are frequently offered as a vegetable on markets, e.g. in Thailand.

Heiser (1973) distinguished two difficult to separate subspecies, based primarily on leaf blade and seed characters. The subsp. *asiatica* (Kobyakova) Heiser occurs in Asia. Heiser postulated that the Asian subspecies migrated long time ago from Africa, and since developed a considerable local variation including feral forms.

10. LUFFA Mill.

Luffa Mill. (1754) without pagination; Cogn (1881) 455; C. Jeffrey (1967) 75; (2001) 1539; Keraudren (1975) 46; I. Telford (1982) 179; Greb. (1986) 937; Heiser & E.E. Schill. (1988) 185; (1990) 120; G.J. Jansen et al. (1993) 194. Type: *Luffa aegyptiaca* Mill. (= *L. cylindrica* L.).

Annual or subperennial, climbing herbs to 10 m long; monoecious (one species dioecious, not in our area); puberulous, later glabrescent, scabrid. Probract fleshy, less than 5 mm long, with glands. Tendrils branched. Leaves simple, mostly lobed. Flowers medium or large, yellow; male flowers bracteate, in peduncled racemes; female flowers solitary, often co-axillary with male inflorescence. *Male flowers*: pedicelled; receptacle-tube small, shallow; sepals enclosing petals in bud; petals free, entire, folded in bud; stamens 3 or 5: two in pairs and one single, the paired ones free or variously united, then appearing as 3 stamens, of which two 2-thecous, one 1-thecous, filaments free, inserted at base of the receptacle-tube, anthers free or free but connivent into a subglobose synandrium, connective mostly broad, thecae marginal, convoluted; disc not apparent. *Female flowers*: receptacle-tube and perianth as in male flowers; ovary elongated or ovoid, smooth or spiny (not so in Thailand

and Malesia), ovules numerous, horizontal; style short, stigma 3-parted, each part 2-lobed; staminodes small; disc absent. Fruit subglobose to (long-)cylindrical, smooth, ribbed or with short spines, when ripe dry and fibrous within, dehiscing by an apical operculum. Seeds numerous, medium-sized, compressed, elliptic-oblong in outline, blackish.

DISTRIBITION. About 7 species, of which 4 in the Old World (mainly Africa) and 3 in America; 2 species in Thailand and Malesia and these widely cultivated, also elsewhere in warm regions.

KEY TO THE SPECIES

Plant flowering during the night, flowers pale yellow. Fruit 10-ribbed. Leaves rather pale green, angular or lobed up to 1/3 deep ..... **1. *Luffa acutangula***

Plant flowering during daytime, flowers bright yellow. Fruit not ribbed. Leaves dark green, variable of shape, lobed up to 4/5 deep ..... **2. *Luffa aegyptiaca***

1. Luffa acutangula (L.) Roxb. (1814) 70; (1832) 713; Backer (1964) 300; Keraudren (1975) 49; S.K. Chen (1995) 333, pl. 86: 7–9; C. Jeffrey (2001) 1540; K.L. Marr *et al.* (2005b) 154–165, f. 2.

Cucumis acutangulus L. (1753) 1011.

Cucurbita acutangula (L.) Blume (1826) 932. Type: not yet designated (Linnaean Typification Project).

Luffa foetida Cav. (1791) 7, tab. 9. Type: not known.

Luffa forskalii Harms (1924) 232.

L. acutangula (L.) Roxb. var. *forskalii* (Harms) Heiser & E.E. Schill. (1990) 123. Type: *Schweinfurth 545* (not seen), Yemen.

Medium-sized climber to 5 m long, stem 2–4 mm diameter, glabrous or subscabrous. Probract with 2–5 glands. Tendrils 3–5-branched. Leaves pale green; blade subcircular in outline, 5–20 cm diameter, unlobed or shallowly 5–7-lobed; petiole 5–12 cm long. Flowers opening at night; pale yellow; male and female perianth similar; male flowers in a raceme; female solitary or usually co-axillary with male raceme. *Male flowers*: pedicel 1–4 cm long; receptacle-tube shallowly campanulate; sepals oblong-lanceolate; petals obovate, *c.* 2 cm long, apex rounded or emarginate; stamens 3, filaments 3–4 mm long. *Female flowers*: pedicel 5–10 cm long; ovary obovate-ellipsoid, 10-ridged. Fruit long-ellipsoid, 10-ridged, 10–30 by 4–10 cm, apex obtuse or acute, green, glabrous; pulp fibrous, operculum small. Seeds numerous, ovate-elliptic in outline, 10–12 by 6–8 mm, smooth or rugose, grey-black, not winged, margin narrow, ± square.

DISTRIBUTION. Originally in S Asia (India); at present widely cultivated.

KEY TO THE FORMS

Plant stout. Fruit 10–30 cm long. Cultivated, widespread in tropical areas ..... **a.** f. ***acutangula***
Plant delicate. Fruit 5–8 cm long. India ..... **b.** f. ***amara***

a. Luffa acutangula (L.) Roxb. f. **acutangula**

This form contains all cultivated or running wild cultivars, including feral forms that have reverted to wild, bitter forms, but excluding forma *amara*.

b. Luffa acutangula (L.) Roxb. f. **amara** (Roxb.) W.J. de Wilde & Duyfjes, *stat. nov. Luffa amara* Roxb. (1814) 70; (1832) 715; (1978) pl. 11; Wight & Arn. (1834) 343; Naudin (1859b) 123; C. Jeffrey (2001) 1540.
Luffa acutangula (L.) var. *amara* (Roxb.) C.B. Clarke (1879) 615; Cogn. (1881) 461; Cogn. & Harms (1924) 69; Chakrav. (1959) 81. Lectotype (Jeffrey 1980b: 792): *Roxb. Ic. No. 460* (K, not seen), India. (Note: Chakravarty, 1959, indicated as lectotype a collection of *Rottler* (K, not seen)).

This is the wild form of *Luffa acutangula*, confined to India. Cogniaux (1881) included here also *L. sylvestris* Miq., but we agree with Harms (in Cogniaux & Harms, 1924) who already remarked that this latter belongs to *L. cylindrica*.
We have not seen the original drawing of Roxburgh, Icones no. 460, but have seen the reproduction of 1978.

2. Luffa aegyptiaca Mill. (1768) without pagination, based on *Momordica luffa* L. (1753) 1009; Backer (1964) 300; Marr et al. (2005a) 137–153, f. 3. Type: a cultivated plant, no specimen located.
Luffa petola Ser. (1828) 303; Miq. (1856) 667. Type: *Petola* (Rumphius (1747) Herb. Amb. 5: 405, tab. 147).
Luffa pentandra Roxb. (1832) 712; Miq. (1856) 667. Type: not indicated.
Momordica cylindrica L. (1753) 1009.
Luffa cylindrica (L.) M. Roem. (1846) 63; C. Jeffrey (1967) 76; (1980a) 54; Keraudren (1975) 47; Greb. (1986) 957; I. Telford (1982) 179; S.K. Chen (1995) 331, pl. 86: 1–6. Lectotype (Wunderlin, 1978): *Herb. Linn. No. 1150.9* (LINN, Linnaean Typification Poject).
Luffa leucosperma M. Roem. (1846) 63; Miq. (1856) 666. Type: not known (China & Cochinchina).
Luffa subangulata Miq. (1856) 667.
Luffa acutangula (L.) Roxb. var. *subangulata* (Miq.) Cogn. (1881) 461. Type: *Horsfield s.n.* (U; iso BM).

(Fig. 6)

Fig. 6. *Luffa aegyptiaca* f. *aegyptiaca*. Thailand. Photo: de Wilde.

Climbers 5–15 m long, stem 2–5 mm diameter, glabrescent, scabrous. Probract 3–5 mm long, acute, with (1–)4–8 glands. Tendrils 2–6-branched. Leaves dark green; blade suborbicular in outline, 5–15 cm diameter, palmately 3–5(–7)-lobed, *c.* 1/4 deep or much deeper, lobes various, blade base cordate, apex acute, margin variously lobed-dentate, glands small; petiole 2–15 cm long. Flowers opening at day-time; bright yellow. *Male flowers*: in peduncled raceme, 5–35 cm long, peduncle 5–12 cm long; bracts ovate-oblong, *c.* 5 mm long, glandular; pedicel 2–10 mm long; receptacle-tube *c.* 5 mm across, mostly hairy inside; sepals triangular, acute(-acuminate), 5–10 mm long, with few glands; petals broadly rounded, 20–45 by 15–30 mm; stamens 3 or 5, exserting from the receptacle-tube, anthers 3–5 mm diameter. *Female flowers*: pedicel 10–30 mm long, ovary ellipsoid or cylindrical, 15–30 mm long, finely hairy, smooth or obscurely ribbed. Fruit globose, or short- to long-ellipsoid or cylindrical, 3–20(–50) cm long, not ribbed, (light and dark) green, glabrous; pulp fibrous, operculum small, beaked; fruiting pedicel 1–6 cm long. Seeds numerous, elliptic in outline, 7–12 by 4–8 mm, dull, blackish, with narrow membranous wing-like border.

DISTRIBUTION. Old World, Australia, naturalized in tropical America.

VERNACULAR NAMES. Vegetable sponge, Loofah.

KEY TO THE FORMS

Plant robust. Fruit ellipsoid to cylindrical, 10–20(–60) cm long ..... **a.** f. ***aegyptiaca***
Plant less robust in all parts. Fruit globose or (broadly) ellipsoid, 3–8(–10) cm long .....
..... **b.** f. ***sylvestris***

a. Luffa aegyptiaca Mill. f. **aegyptiaca**

This is the cultivated form, very variable in fruit-size; often escaped into wild (secondary) vegetations, and at present occurring in all tropical areas.

b. Luffa aegyptiaca Mill. f. **sylvestris** (Miq.) W.J. de Wilde & Duyfjes, *comb. & stat. nov.*
Luffa sylvestris Miq. (1856) 666. Type: *Petola silvestris* Rumph. (1747) Herb. Amb. 5: 409, tab. 150.
Luffa aegyptica Miller var. *peramara* F.M. Bailey (1890) 29. Type: not indicated, Australia, Mulgrave River.
Luffa insularum A. Gray (1854) 644.
Luffa cylindrica (L.) M. Roem. var. *insularum* (A. Gray) Cogn. (1881) 459. Lectotype not indicated, Samoan Islands, Friendly Islands, Fiji. (not seen).
Luffa cylindrica (L.) M. Roem. var. *minima* Naudin (1862) 165. Type: not indicated (cultivated in Paris from seed from New Caledonia).
Luffa cylindrica (L.) M. Roem. var. *leiocarpa* Naudin (1859b) 121; I. Telford (1982) 180.
Luffa leiocarpa F. Muell. (1863) 107.

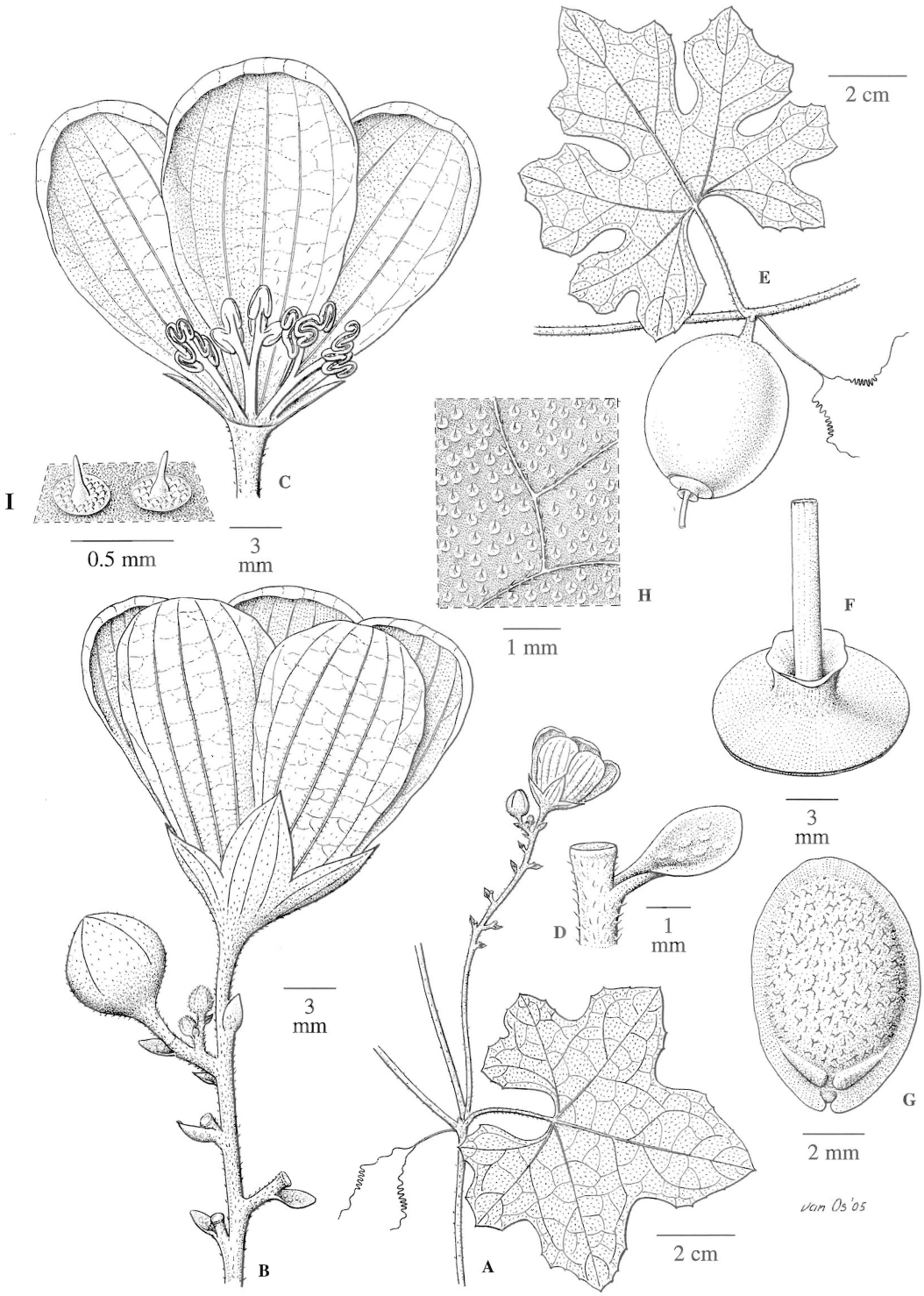

Fig. 7. *Luffa aegyptiaca* Mill. f. *sylvestris* (Miq.) W.J. de Wilde & Duyfjes. **A**. Node with male inflorescence. **B**. Apex of male inflorescence. **C**. Male flower, opened. **D**. Detail of male pedicel with bract, shifted up along pedicel. **E**. Node with fruit. **F**. Lid of fruit. **G**. Seed, same shape as in cultivated form, but smaller. **H**, **I**. Detail of upper surface of leaf blade with coarse hairs inserted on cistolyths (all: *De Wilde & Duyfjes 21861*).

Luffa aegyptiaca Mill. var. *leiocarpa* (Naudin) Heiser & E.E. Schill. (1990) 123. Type: *Mueller* (K, not seen) Australia.

(Fig.7)

Tendrils (simple or) 2- or 3-branched. Fruit globose, 3–5 cm diameter, or ellipsoid, 5–8(–10) cm long; fruiting pedicel 1–3 cm long. Seeds brown-black, *c.* 7 by 4 mm.

DISTRIBUTION. Common in eastern Malesia (often coastal), Australia and the Pacific; similar plants also known from Jemen, India, and elsewhere.

11. **Momordica** L.

Momordica L. (1753) 1009; (1754) 440; Cogn. (1881) 427; Cogn. & Harms (1924) 8; Chakrav. (1959) 86; C. Jeffrey (1967) 17; Keraudren (1975) 36; I. Telford (1982) 166; S.K. Chen (1995) 326; C. Jeffrey (2001) 1521; W.J. de Wilde & Duyfjes (2002) 133. Type: *Momordica balsamina* L.

Distribution. About 40 species in the Old World, most species in Africa; 8 species in Asia.

KEY TO THE SPECIES

1. Plant monoecious. Male bract halfway the pedicel. Fruit fusiform or elongate, 2–11(–40) cm long, knobbly irregularly ridged ..... ***M. charantia***
   Plant dioecious. Male bract subapical. Fruit spiny or ridged 2

2. Male petals 40–60 mm long. Petals cream. Fruit broad-ellipsoid, 10—15(–20) cm long, densely soft spiny or sharply tuberulate ..... ***M. cochinchinensis***
   Male petals 20(–30) mm long. Petals yellow. Fruit ellipsoid, 3–5 cm long, with 8–10 irregular lengthwise ridges ..... ***M. subangulata***

1. Momordica charantia L. (1753) 1009; Willd. (1805) 602; Blume (1826) 927; Naudin (1859b) 131; Miq. (1856) 663; Cogn. (1881) 436; Cogn. & Harms (1924) 24; Chakrav. (1959) 88; (1982) 89, f. 8–10; Backer (1964) 299; C. Jeffrey (1967) 31; Keraudren (1975) 42; I. Telford (1982) 167; S.K. Chen (1995) 327; Reyes et al. (1993) 206; Walters & Decker-Walters (1988) 286; W.J. de Wilde & Duyfjes (2002) 135. Lectotype (C. Jeffrey, 1967): *Herb. Clifford 451, momordica 2* (BM-000647445, Linnaean Typification Poject), cultivated at Hartekamp, The Netherlands.
Momordica muricata Willd. (1805) 602; Lubbock (1892) 601, f. 384.
M. charantia var. *muricata* (Willd.) Chakrav. (1982) 92, f. 1–7. Type: (Chakravarty, 1982): Rheede Hort. Mal. 8 (1688) plate 10.

Momordica balsamina auct. non L.: Blanco (1837) 768; Merr. 1918: 370 (*Species Blancoanae 481*).
Momordica cylindrica ('*cilindrica*') auct. non L.: Blanco (1837) 769, Merr. 1918: 370.

For the description see de Wilde & Duyfjes (2002).

DISTRIBUTION. Tropical and subtropical Africa and S, E, and SE Asia, Malesia, Australia and the Pacific; also common in America, where introduced. Cultivated mostly as larger-fruited cultivars. Immature fruit and young shoots are used as a vegetable; the fruit is medicinal.

HABITAT. Scrub and secondary places, forest edges; at low and medium altitudes.

VERNACULAR NAME: Balsam Pear, Bitter Melon, Bitter Gourd.

KEY TO THE FORMS

Plant more delicate. Fruit ± fusiform, 2–5 cm long, with *c.* 6 rows of few, low, broad-based soft prickles with acute apex. Growing wild ..... **a.** f. ***abbreviata***
Plant generally stouter. Fruit (narrowly) elliptic to oblong, 6–40 cm long, surface with bluntish soft thorn-like protuberances and/or rounded warts in more or less longitudinal rows. Cultivated or escaped near villages ..... **b.** f. ***charantia***

a. Momordica charantia L. f. **abbreviata** (Ser.) W.J. de Wilde & Duyfjes, *stat. nov.*
Momordica charantia L. var. *abbreviata* Ser. (1828) 311; Cogn. (1881) 437, p.p., excl. *M. muricata* Willd.
Momordica charantia L. subsp. *abbreviata* (Ser.) Greb. (1986) 926. Type: not seen (G).
(Fig. 8)

This is the wild form, widespread in the Old World and already long-time naturalized in tropical America. It is generally more delicate than the cultivated varieties under forma *charantia*, the latter including, however, frequently cultivated plants with small fruits of only *c.* 5 cm long or more.

The distinction between forma *abbreviata* and forma *charantia* seems rather sharp on the characters given in the key, but vegetatively and in the flowers, both forms are similar, though forma *abbreviata* is more delicate in all parts.

b. Momordica charantia L. f. **charantia**

The forma *charantia* comprises all cultivated varieties, including plants with small as well as with larger fruits. It should be noted that taxa with small densely muricate-tubercled

Fig. 8. *Momordica charantia* f. *abbreviata*. Thailand. Photo: P. Phonsena.

Fig. 9. *Momordica charantia* f. *charantia*. Thailand, market. Photo: de Wilde.

fruits and named *Momordica muricata* (Willd., 1805; based on Rheede 1688: 19, tab. 10) also belong under forma *charantia*. Most likely the cultivated form originated from the wild form in India (Williams & Ng, 1976).

(Fig. 9)

2. Momordica cochinchinensis (Lour.) Spreng. (1826) 14; Ridl. (1922) 848; Reyes et al. (1993) 206; S.K. Chen (1995) 329, pl. 85: 5–10; C. Jeffrey (2001) 1521; W.J. de Wilde & Duyfjes (2002) 137. Type: *Loureiro s.n.* (BM), from Cochinchina (Vietnam).

For the description see de Wilde & Duyfjes (2002).

This is a very variable botanical species, found wild as well as cultivated, of which in Thailand and Malesia only incidentally the immature fruit is eaten as a vegetable.
A separate wild form, to be distinguished from cultivated forms, does not exist.

VERNACULAR NAME. Sweet Gourd.

USES. Bitter Gourd (*Momordica charantia*) and Sweet Gourd both have numerous medicinal uses, the latter especially in China.

3. Momordica subangulata Blume (1826) 928 is a wild, botanical species of which the shoots are occasionally used as a vegetable. Its subsp. *renigera* (G. Don) W.J. de Wilde (2002: 147) has a comparatively stout habit and a tuberous rootstock. It is occasionally locally cultivated by indigenous tribes as a vegetable in the north of Thailand (W.J. de Wilde & Duyfjes, 2002: 147–148).

For the description see de Wilde & Duyfjes (2002).

The species **Momordica balsamica** L., Balsam Apple (Africa and drier areas of NW India and introduced in Australia) and **Momordica dioica** Willd. (India) are occasionally used medicinal or, the latter, as a vegetable. Their use is not recorded from our area. See also Reyes *et al.*, 1993: 209.

12. **Praecitrullus** Pangalo

Praecitrullus Pangalo (1944) 203. Type and only species: *Praecitrullus fistulosus* (Stocks) Pangalo = *Citrullus fistulosus* Stocks.

1. Praecitrullus fistulosus (Stocks) Pangalo (1944) 203; Chakrav. (1990) 331; A.K. Singh (1990) 16; Whitaker (1990) 320; C. Jeffrey (2001) 1537.
Citrullus fistulosus Stocks (1851) 74, tab. 3.
Citrullus vulgaris Schrad. var. *fistulosis* (Stocks) Duthie & Fuller (1882/93) 46, t. 47.
Colocynthis citrullus var. *fistulosis* Chakrav. (1959) 116. Type: unknown.

This species is locally cultivated in mountainous northern India as a vegetable. It is unknown in our area, but it can be expected there in the future.

13. **Sechium** P. Browne

Sechium P. Browne (1756) 355, *nom. cons.*; Ser. (1828) 313; Cogn. (1881) 900; Backer (1964) 306; C. Jeffrey (2001) 1555. Type: *Sechium edule* (Jacq.) Sw.

Medium or stout climbers, perennial, monoecious; plants (almost) glabrous. Probract absent. Tendrils 2–5-branched. Leaves simple, angular, subentire or shallowly lobed, base cordate. Flowers rather small, short-pedicelled; male flowers in racemes, female flowers solitary, 2 or 3, often co-axillary with male inflorescence; perianth dirty whitish or pale yellowish. *Male flowers*: receptacle-tube shallow; sepals linear; petals free, elliptic-oblong,

(sub)acute, margin entire; stamens 3, filaments united into a column, inserted at base of receptacle-tube, ± free at apex, anthers two 2-thecous, one 1-thecous, thecae sigmoid; disc (pistillode) absent. *Female flowers*: short- or long-pedicelled; perianth as in male flowers; ovary ovoid(-oblong), smooth or with few (coarse) hairs, unilocular with apically one pendulous ovule, style slender, short, stigma capitate, 2-lobed, lobes entire or lobulate, recurved; staminodes absent, but base of receptacle-tube sometimes with 10 shallow pouches. Fruits carnose (or fibrous, not in Asia), ± obovoid, smooth or sulcate, glabrous, setose or with soft spines. Seed one, large, ovoid, sometimes ± compressed, testa woody, glabrous, with sharp edges.

DISTRIBUTION. About 5 species in 2 sections in tropical America. One species, *Sechium edule*, widely cultivated.

1. Sechium edule (Jacq.) Sw. (1800) 1150; Ser. (1828) 313; Cogn. (1881) 901; Chakrav. (1959) 204, (1990) 333; Backer (1964) 306; Newstrom (1990) 141–149; Engels & C. Jeffrey (1993) 246; S.K. Chen (1995) 394, pl. 105: 1–5.
Sicyos edulis Jacq. (1760) 32.
Chayota edulis (Jacq.) Jacq. (1780) 245. Neotype (C. Jeffrey, 1980a: 59): *Jacquin* (BM?, not seen), Cuba.

(Fig. 10)

Fig. 10. *Sechium edule*, left hand female flower; right hand male flower. Thailand. Photo: de Wilde.

Stout perennial herb, 5–10(–15) m long, stem 2–10 mm diameter, with tuber-like rootstock; almost glabrous. Tendrils 2–5-branched. Leaves subcircular in outline, 10–20 cm diameter, usually 5-angular or shallowly lobed, lobes acute, margin finely sparsely dentate, finely scabrous especially on upper surface, distinctly reticulately nerved; petiole 5–15 cm long. *Male racemes*: 8–30 cm long, 10–30-flowered, with flowers 2(–6) subfasciculate. *Male flowers*: pedicel 1–6 mm long; receptacle-tube *c.* 5 mm wide; sepals oblong-linear, 5–7 mm long; petals subglabrous, 10–17 mm long; staminal column 1–2 mm long, spreading free parts *c.* 1 mm long, anthers *c.* 2 mm diam. *Female flowers*: ovary *c.* 5 mm long, glabrous or ± hairy, style 3–4 mm long, stigma *c.* 3 mm diameter, papillose. Fruit indehiscent, 7–15(–20) cm long, often with irregular surface, low-warted or irregularly sulcate, smooth or (soft) spiny, green or whitish; later on the embryo germinating in the seed and emerging at apex of fruit; fruiting pedicel 2–3 cm long. Seed 5–10 cm long.

DISTRIBUTION. Originally cultivated in Central America, now widely cultivated (usually over trellis) in the tropics all over the world.

VERNACULAR NAME. Chayote.

USES. The shoots and fruits are commonly used as vegetable. The nectariferous male flowers attract bees.

Sechium edule was already known in pre-Columbian times and is now known from numerous cultivars or land-races all over the world in the tropics and subtropics. Feral forms are known in Central America. A very much related wild species in America is *S. compositum* (Donn. Sm.) C. Jeffrey, with bitter fruits. (See Jeffrey, 1978; Newstrom, 1990).

14. Siraitia Merr.

Siraitia Merr. (1934) 200; W.J. de Wilde & Duyfjes (2006) 499. Type: *Siraitia silomaradjae* Merr., Sumatra.

An Asian genus with 2 or 3 species.

1. Siraitia grosvenorii (Swingle) A.M. Lu & Zhi Y. Zhang (1984) 29, f. 1: 1–7; (1986) 162, pl. 43: 1–7; W.J. de Wilde & Duyfjes (2006) 499.
Momordica grosvenorii Swingle (1941) 198.
Thladiantha grosvenorii (Swingle) C. Jeffrey (1979) 393. Type: *Taam* 1 (holo NA, not seen), Guangxi, China.

This is a botanical species from southern China where it is locally cultivated for the sweet and medicinal fruit (fruit-pulp). The fruits can be found, imported from China, in markets in Thailand, or in Chinese or exotic shops elsewhere all over the world.

15. Trichosanthes L. (1753) 1008; (1754) 439; Chakrav. (1990) 327; Rugaya (1999) 61; Gildemacher et al. (1993) 271; C. Jeffrey (2001) 526; W.J. de Wilde & Duyfjes (2004) 17; Duyfjes & Pruesapan (2004) 82. Lectotype (Hitchcock & Green, 1929): *Trichosanthes anguina* L.

Trichosanthes is the largest genus of Asian Cucurbitaceae, with about 100 species. Several wild species are popular and cultivated in China for medicinal purposes.

Two species are relevant in our area: **T. cucumerina** L. var. **anguina** (L.) Haines (1925, 388), an only cultivated variety, possibly originating from India. The wild **T. edulis** Rugaya var. **sativa** Rugaya (in Rugayah & de Wilde, 1999: 256) is endemic in New Guinea, where the roasted or cooked immature fruits are eaten.

Trichosanthes dioica Roxb. (1832, 701; Chakrav. 1959, 54) is a dioecious climber with a perennial rootstock, extensively cultivated in India, where the green fruits and leaves are used as vegetable. It is also collected in the wild, but there are some cultivated agricultural forms (Chakravarty, 1990: 327). The species is not yet seen cultivated in Thailand or in the Malesian area.

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